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SUMMARY OF THE POPULATION OF INJURIOUS INSECTS IN KANSAS FOR 1933— THE THIRD ANNUAL SUMMARY*

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This summary covers the calendar year 1933 in Kansas only. The method of obtaining the information differed in no essential respects from that used in the summary for 1932(2). For reasons of economy, the data are presented in a compact table (Table II). However, the summary numbers can be readily transferred to the counties of state maps to form a picture of the population of every insect included in the report.

Summary of the Weather of Kansas for 1933(3)

The year opened with one of the mildest Januarys on record, or since 1887. The month was exceptionally dry, sunshiny and pleasant. There were no cold waves and no periods of zero weather. February was one of the driest on record. A very severe cold spell occurred from the 6th to the 10th, but the latter half of the month was mild and pleasant. There was less snowfall than usual and dust storms in western counties were frequent and severe. March averaged normal for temperature, precipitation and sunshine, making conditions favorable for spring work. Snowfall was light, but rains were

*Contribution No. 423 from the Department of Entomology.

(1) In gathering data for this summary, the writer was materially assisted by Dean H. J. Umberger, Dr. E. G. Kelly, and all of the county agricultural agents in Kansas; by Mr. Floyd K. Reed, U. S. Crop Statistician at Topeka; Prof. H. R. Bryson, and the entomological staff at the Kansas State College. Mr. J. O. Rowell assisted in preparing the tables. This report embodies results obtained on Experiment Station Project No. 6.

(2) Smith, Roger C. and Kelly, E. G. A summary of the population of injurious insects in Kansas for 1932. Kans. Ent. Soc. Jour. 6 (2) :37-59. 1 pl. 1933.

(3) The weather data included here are from U. S. Weather Bureau climatological data, Kansas Section, Vol. 47, by S. D. Flora, 1933.

TABLE I - SUMMARY OF WEATHER DATA FOR THE STATE OF KANSAS FOR THE INSECT YEAR,

September 1, 1932 to December 31, 1933

Year	Month	Temperature					Precipitation (in inches)					
		State Average	Maximum	Minimum	Average for 46 years	Departure from normal	State Average	Average for 46 years	Departure from normal	Eastern third	Middle third	Western third
1932	Sept.	68.5°	101°	35°	69.50°	-0.8°	2.15	2.78	-0.72	2.79	2.36	1.28
1932	Oct.	55.2°	92°	14°	56.8°	-1.7°	0.99	1.99	-1.12	1.37	0.99	0.62
1932	Nov.	41.0°	82°	- 2°	43.1°	-3.0°	0.32	1.27	-1.04	0.68	0.17	0.10
1932	Dec.	28.1°	78°	-26°	24.3°	-3.8°	1.14	0.86	-0.28	2.31	0.68	0.24
1933	Jan.	30.3°	72°	3°	29.6°	+0.7°	0.25	0.66	-0.41	0.60	0.12	0.02
1933	Feb.	31.4C°	75°	-26°	33.0°	-1.6°	0.26	1.02	-0.76	0.44	0.17	0.18
1933	Mar.	46.1°	86°	5°	43.0°	+3.1°	1.47	1.47	0.00	2.56	1.28	0.58
1933	Apr.	54.7°	93°	11°	54.7°	0.0°	2.42	2.65	-0.23	3.10	2.00	2.17
1933	May	64.3°	105°	32°	63.6°	+0.7°	3.80	3.71	+0.09	5.21	2.71	3.48
1933	June	80.7°	114°	42°	73.6°	+7.1°	0.87	4.00	-3.13	0.98	0.74	0.88
1933	July	81.4°	116°	48°	78.5°	+2.9°	2.80	3.34	-0.54	3.73	2.82	1.84
1933	Aug.	76.7°	109°	49°	77.3°	-0.6°	5.21	3.21	+2.00	5.26	5.45	4.91
1933	Sept.	74.2°	103°	34°	69.6°	+4.7°	2.25	2.77	-0.52	3.52	1.90	1.33
1933	Oct.	57.8°	89°	21°	56.9°	+0.9°	0.86	1.96	-1.10	1.57	0.52	0.50
1933	Nov.	47.2°	84°	12°	43.2°	+4.0°	0.72	1.26	-0.54	0.69	0.50	0.97
1933	Dec.	39.6°	78°	0°	24.3°	+15.3°	1.27	0.86	+0.41	1.58	1.18	1.04
Totals for the calendar year							22.18	26.91	-4.73	29.24	19.39	17.90

Correction: —0.28 in. Dec. 1932 should be +0.28.

ample over most of the state for crop needs.

Ample rains came the last 12 days of April, but wheat had deteriorated rapidly up to that time. Temperatures and sunshine conditions were normal for the month. Rains for May, while liberal were unevenly distributed as to time and locality. No frosts occurred. There was a severe dust storm in western Kansas on the 22nd. June was the hottest June since 1887, and the second driest. There was an unusual amount of sunshine and the hot, dry weather was very severe on all crops. Wheat ripened prematurely; alfalfa made little growth and many pastures turned brown. July also was one of the hottest and driest Julys on record. The rainfall deficiency with that of June made the driest two months' period on record, except in 1917. The heat and drought were intensified by an unusual amount of bright sunshine. There were only two shower periods—8th. 9th and the 18th. The month was very unfavorable to crops. The first 10 days of August were hot and dry, but cooler weather came on the 10th and rains on the 20th. Moisture was adequate for immediate needs by the end of the month nearly all over the state. September was the warmest on record, except in 1911 and 1931, and was deficient in rainfall except in the western

half of the state. There was an unusual amount of sunshine and there occurred no frosts of any consequence. October was unusually dry, but sunshiny and pleasant. The first killing frost occurred on the 8th or 9th in the western half of the state and on the 22nd or 25th in the northeastern and southwestern parts of the state. Mild, sunshiny, pleasant weather prevailed in November, and there was a shortage of precipitation over most of the state, making 17 months out of 23 in which there was a deficiency of rainfall. Only one November in 46 years—that of 1890—passed without a lower temperature somewhere in the state. Unusually mild, pleasant and sunshiny weather prevailed over Kansas during December, with more rain than had fallen in December since 1924. It was the third December on record with no measureable snowfall reported anywhere in the state. The month's rainfall was unusually well distributed geographically, but mostly fell on the first two days, except in the eastern third where there were also good rains on the 19th.

Summary of the Numbers of Questionnaires Returned

Group I—Entomologists residing within the state: 9 reports in July; 10 reports in October.

Group II—County agricultural agents of the state. Of the 78 in the state, reports were received from 62 in May(4), 58 in July and 50 in October.

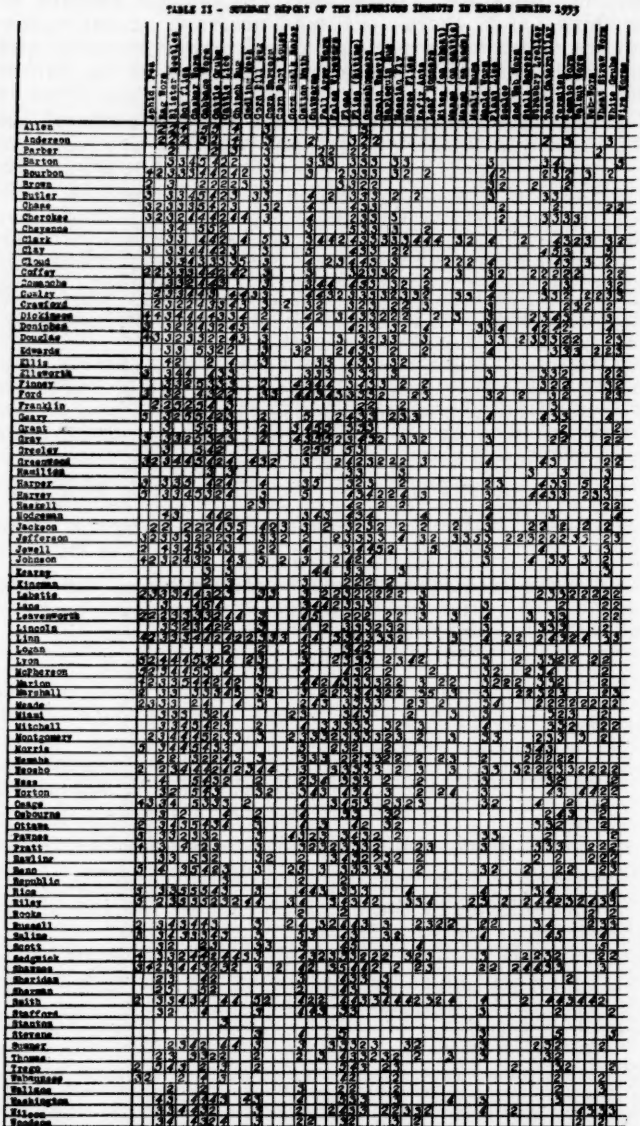
Group III—Leading farmers in the state selected and circularized by Mr. Floyd K. Reed: 63 replied in July. This group was not circularized in October. Vocational agricultural teachers: 22 reports in July; 19 reports in October.

Grand total of questionnaire replies for the year—293.

In addition to these reports, all of the insect pest survey notes by Prof. Bryson, many verbally reported observations by Dr. E. G. Kelly, and of departmental staff members and observations by the writer made for this report, are included in this summary.

(4) Through an error, copies of the July 1 questionnaire were sent to the county agricultural agents on April 14, 62 replies being received.

TABLE II - SUMMARY REPORT OF THE INSPECTIONS ISSUED IN KANSAS DURING 1933



The summary numbers carry the same meaning as in previous reports, viz:

0—The insect was neither seen in the county nor reported present.

1—A few individuals seen or reported, the species being scarce. In the averaging of reports, 0 and 1 reports were not included.

2—The species was plentiful but no noticeable damage was done.

3—The species was abundant, some damage was seen or reported.

4—The species occurred in local outbreaks, important damage was done in some fields.

5—The species was in general outbreak or was as plentiful and destructive as has occurred formerly when particularly plentiful.

Explanatory Notes on the More Striking Insect Conditions During 1933

The Apple Curculio continued to be an important pest in northeastern Kansas. Where orchards were burned with the pressure burners, practically no damage was done by the curculios, but elsewhere these insects were plentiful and damage was more or less severe, according to Dr. R. L. Parker.

Aphids on radish and turnip were more plentiful than usual in gardens during the early spring. It was noted that aphids were particularly disasterous to young cabbage plants which had been shipped into the state from the South.

The arborvitae aphid was plentiful on the college campus but not particularly injurious during either the early spring or early fall.

The melon aphid occurred on squashes and melons in numbers in Riley County during July. Departmental correspondence on this insect was heavier than usual.

The apple grain aphid was observed in large numbers on wheat in Logan and Riley Counties in November.

The corn leaf aphid was abundant during July at the college farm. This species was more plentiful than usual on sorghum and corn tassels in northeastern Kansas, according to observations made by Doctor Painter.

The pea aphid occurred in a widespread, serious

outbreak in the eastern half of the state. First reports came on April 7 from Herington (Dickinson County). The outbreak rapidly became severe in alfalfa fields of eastern-central Kansas or crop areas 3, 5, and 6 (see 1932 summary). The late spring caused the outbreak to appear several weeks later than in 1931. Control efforts began at Manhattan on April 19. Good rains on April 20 stimulated the alfalfa growth but in Riley County large numbers of aphids could be found up to May 25 when sudden hot weather caused them to disappear on about the 28th. At that time, lady bird beetles and Chrysopids were very plentiful.

Early garden and field peas were severely attacked also and many plantings at Manhattan were either killed by April 22 or so stunted that they were worthless. A Lawrence canning company, which had a heavy infestation in its pea fields, introduced several hundred thousand lady bird beetles from California into the fields and claimed to have secured good results from them, but they were introduced at about the time the aphids disappeared naturally.

Nearly every alfalfa field between Manhattan and Lawrence was observed in June to have one or more spots where severe aphid injury had been done. Hundreds of acres of alfalfa in the triangular area between Riley, Pawnee and Lyon Counties were plowed up after the initial onslaught of the aphids, which left the plants brown and dry. Some fields might have revived, favored by timely rains, since spots in Riley County fields were observed to have done so.

Biting Flies on live stock were about average during the summer. Doctor Kelly reported seeing horn flies as early as April 10 in southwestern Kansas in Clark and Commanche Counties, especially.

Blister Beetles were again plentiful and did considerable damage to gardens and alfalfa in the state, but the population of these insects was about normal. They were state-wide in distribution.

Canker Worms appeared in a pronounced outbreak in the entire eastern half of the state. Emergence of adults began early. Fifty female fall canker worm moths were taken in Greenwood County on January 3. Emergence continued during January, the peak being reached about January 21. Spring canker worm moths appeared during the last of January, the peak of emergence being

reached March 12. In Manhattan the larvae hatched about April 22 and were practically grown by June 1st, at which time many elms and a few hackberry trees were wholly defoliated by them. Riley County was said to have had the worst defoliation of trees in twelve years, and probably the worst in the state for the season. Severe dust storms made it necessary to renew the bands three or four times, especially in Sedgwick and Butler Counties.

The **Codling Moth** was more severe in northeastern Kansas, according to Professor Dean and Doctor Parker, than it had been for four or five years. This condition was primarily due to the exceedingly hot, dry weather which that region experienced during June, July and August, and the building up of the moth population.

The codling moth was somewhat less plentiful in the Arkansas River Valley during 1933 because of better control work conducted in that area. At Hutchinson, in one orchard where all of the apples were picked in early summer last year when the crop was short, there was very little injury. Where only two sprays were applied to the orchard previous to a hail storm in early summer and none after the storm, effective control was secured.

It has been impossible to control codling moth by means of sprays in northeastern Kansas during late summer because of apple curculio injury by the newly emerged adults.

Chinch Bugs occurred in a pronounced outbreak during June and early July in the eastern two-thirds of the state. The winter of 1932-1933 was ideal for chinch bugs. More bugs went into hibernation than in the previous fall. By February 23, there was an average of 40 bugs to the grass clump with only a mortality of five per cent, according to Professor Bryson.

The latter part of April the adult bugs were exceptionally plentiful at the base of wheat clumps on the wheat variety plots at Manhattan. Migration began about ten days earlier than usual, because of the dry, hot weather which hastened the maturity of wheat and oats. A heavy migration of adult bugs occurred at Manhattan on April 29 and May 8. By May 1, the adult bugs were so plentiful in the wheat and barley plots that severe injury was done. Eggs were present May 5 and young nymphs the latter part of May. On June 14 the nearly grown nymphs and adults were migrating at the

college farm in large numbers and an extensive barrier system was in operation. There being very little crabgrass and other weeds in wheat fields on which the bugs could feed for a time, the migration was a little shorter and more intense than usual, though it was still in progress on June 28. Wheat ripened very unevenly. The damage to wheat, corn and sorghums was the greatest since 1927. Practically every corn or sorghum field in the eastern half of the state adjoining fields of small grains had a few rows destroyed and perhaps a half dozen more injured by chinch bugs. The damage appeared to be worst around Manhattan and Wichita.

The autumn and early winter of 1933 were very favorable to chinch bugs and very large numbers went into hibernation. The long, dry fall with gradually increasing coldness gave the bugs plenty of time to find the best type of winter quarters.

False Chinch Bugs (Nysius ericae Schill.), ordinarily unimportant feeders on weeds, were more plentiful than for at least ten years. Damage in the eastern third of the state to radishes, turnips, lettuce, spinach, mustard and some other early garden plants was observed and reported to have been very serious during May. Turnips and radishes were largely ruined in Greenwood, Sedgwick and Butler Counties. By the middle of May, these insects were very plentiful in the gardens and the alfalfa fields of Riley County, feeding on shepherd's purse, annual violet, purslane, as well as on alfalfa. The first generation matured about May 22. Milliken(3) reported five to seven generations a year in Kansas. On June 14 the second generation nymphs were observed migrating in very large numbers in grassland.

False Wireworms were again plentiful. The dry summer and fall of 1933, with the large amount of grain left in the fields because it was not worth cutting, favored the development of the larvae of this species, according to Doctor Kelly. Thousands of acres which were not planted to wheat during the fall of 1932 were planted to barley in the spring of 1933. Serious damage occurred to the barley because the lack of moisture caused a delay in germination. More than one half million

(3) Milliken, F. B. Nysius ericae, the false chinch bug. Jour. Agr. Res. 13(11):571-578. 1918.

acres of western Kansas farm land were tilled between May 15 and June 10 as a control for this insect, according to the extension entomologist.

Clover Leaf Weevils did damage in only two counties in 1933—Linn and Franklin. The population in Riley and adjoining counties was about average without any appreciable damage being done, though adult beetles were found in considerable numbers under hay piles and in a grasshopper catcher at the college farm.

Colorado Potato Beetles were slightly more troublesome than usual. Reports of damage in Miami County (Paola) June 9 indicated that they had been unusually destructive.

The Corn Earworm, always a destructive pest in Kansas, was fully as plentiful as in the previous year in late sweet corn, in sorghum and kafir heads, in tomatoes, peppers and on alfalfa foliage during October. Many larvae were sent to the Department of Entomology during the fall under the impression that they were fall army worms.

Cotton Leaf Worm Moths were exceptionally plentiful during the early fall in Riley County. Moths were seen in numbers at lights up to near the end of November. They were reported as exceptionally plentiful in the southwestern part of the state.

Army Cutworms (Chorizagrotis auxiliaris) appeared in a widespread outbreak in the eastern half of Kansas, damage being worst in the southern part of this area. The early reports of damage to wheat, oats, rye and barley fields were received March 10, from Sumner, Cowley, Kingman, McPherson, Sedgwick, and Harvey Counties. Injury was only a little less in Reno, Russell, Butler and Saline Counties. Very severe damage was done in many fields. By early April the large population of cutworms was damaging alfalfa and vetch, in addition to wheat and oats in Dickinson, Saline and Riley Counties. As many as 90 cutworms to the square foot were taken in a patch of vetch in the college orchard and the average population was determined to be 45 larvae to the square foot. By April 20, larval damage had ceased and most of the larvae had pupated. Doctor Kelly reported that 5,000 pounds of white arsenic had been sold for making poisoned bran mash in Harvey County. Arsenate of lead was sold to many farmers in the Wichita district to use in the mash, and uniformly poor results were obtained.

A temperature of 14 degrees F. below zero on March 20 did not diminish the numbers of the cutworms in spite of opinions to the contrary. The low early spring temperatures gave wheat a severe setback. Without cutworms the plants would have survived, but the worms quickly destroyed the young growth and so reduced the stand that on April 17, wheat in the cutworm area was graded at only 17 to 27 per cent of normal.

The cutworm moths began to appear about April 22 at lights, and by May 22 they became a great annoyance around homes. The moths hid in trees and bushes by the thousands during the day and began their evening flights about five o'clock.

Variegated Cutworms appeared in fair numbers in alfalfa fields of Riley County, but no damage was done.

Feltia annexa larvae damaged one of the Agronomy Farm alfalfa plots severely in early October. At that time the larvae were nearly grown and so numerous that they prevented the young growth from appearing following the last cutting. Cutworm damage to alfalfa in the fall is very unusual, this being the first observed since 1920, at least. Crumb (Tech. Bul. 88, Bur. of Ent.) says there are three full broods and a partial fourth of this species, the partial one being killed by cold weather. By the middle of October many dead larvae were found just below the surface of the soil.

The Clover Cutworm (Scotogramma prob. **trifolii,** det. Schaus)(4) occurred for the first time in Kansas during 1933 and was so plentiful during August and September that numerous specimens were sent to the college from many places in western Kansas. They were taken on a smoke bush at Manhattan, but elsewhere they were confined to weeds. Many farmers feared they were army worms which would later damage wheat. They were particularly plentiful around Dodge City and Hutchinson.

Diallagma angustiorata moths were exceptionally plentiful in Riley County during October and November. They occurred at lights and in general flight, as revealed by automobile lights on warm evenings. Professor Bryson found one moth of this species in the kitchen on December 18.

(4) Gibson, Arthur. Cutworms and their control. Dept. Agri Ent. Branch, Canada. Bul. No. 10. 1915.

Flea Beetles were slightly more damaging to early radishes, egg plants and turnips than usual during April, and during May they occurred in a general outbreak over most of the state. Doctor Painter observed these beetles migrating into wheat during October from newly plowed grassland in the wheat nursery at Manhattan.

The Green Striped Maple Worm assumed its usual virtual obscurity this year. Some larvae were found at Manhattan and at Atchison on June 28, but no appreciable damage was done by either of the two generations.

Grasshoppers were less destructive and plentiful than usual during 1933. By the last of June, the two-lined grasshopper, **M. packardi,** and the red-legged species were quite plentiful at the college farm, and some damage was done to sweet clover and to alfalfa flowers. A hopper catcher was made and large numbers caught. During the rest of the season, grasshoppers were scarce at Manhattan. No reports of damage were received during the late summer and early fall, but hoppers were observed by Doctor Kelly to have been most plentiful in Ford, Meade and Pawnee Counties. Late summer damage was observed by Mr. S. G. Kelly in Kearney County also.

The Head Maggot of Sheep was reported to have become a serious pest in Kiowa County. The head maggot was a very important pest 40 years ago, according to Professor Dean; then it declined but lately has increased to important numbers again.

The Hessian Fly was below normal in numbers and destructiveness during 1933, although the population was large. The fall brood of 1932 was very large, but the spring brood was small. The fly helped to weaken the plants in the spring and later they succumbed to freezes, which occurred as late as April 11 to 14, and to dry weather. In April, a high percentage of clumps were infested. Professors Laude and Clapp reported 80 to 100 per cent infestation in Russell County.

During September, the fly became plentiful, following good rains, there being a fall supplemental brood in many sections. The southwestern part of the state was very dry, however, and some wheat was blown out of the ground. Adult flies came out in numbers in early September and deposited eggs heavily on volunteer and early sown wheat. However, in general, the infestation of fall sown wheat, according to J. R. Horton, was un-

usually light except in the southeastern part of the state where there were some really serious infestations. He determined the percentage of infested stalks to be 11 per cent in southeast Kansas, 6 per cent in northeast Kansas, and 3 per cent elsewhere, except in southwest Kansas, for which no data were obtained. Doctor Painter determined the infestation to reach a maximum of 12 percent of the plants in the date-of-seeding tests at the college farm.

Mites were more plentiful and destructive to evergreens than usual. They were favored in their development by the hot, dry weather which also made their ravages more apparent by the poor condition of the trees.

The brown mites on wheat were less plentiful in southwest Kansas this year, according to Doctor Kelly. Some damage, however, occurred in Sumner and Harper Counties. The reduction in wheat acreage of about 15 per cent, resulting in the larger part of this land remaining in stubble over winter, is favorable to a large increase in this pest for 1934.

Potato Leafhoppers were reported to be very abundant in Greenwood, Sedgwick and Butler Counties on June 3, where they were ruining potatoes, particularly the variety Triumph.

The apple leafhoppers were conspicuous by absence in the Arkansas Valley region, according to Professor Wilbur. Their numbers increased toward the northeastern section, where light damage occurred.

Striped Cucumber Beetles were more damaging than usual to cucumbers and squashes, because of the dry, hot weather.

Tent Caterpillars appeared in a general state-wide outbreak during the late summer of 1933. The very large number of webs in wild cherry and wild plum trees was a significant insect feature of the year. The webs were most in evidence in southern and eastern Kansas.

The Squash-vine Borer (Melittia satyriniformis) and the melon worm **(Diaphania hyalinata)** were both observed and reported to have been more plentiful and destructive during 1933 than for many years. Both, particularly the latter, attacked the squash fruit and cantaloupes.

Tarnished Plant Bugs concentrated on some late potatoes on a botany plot in October and by their feeding killed the tips of the stems and the foliage. It was the first marked results of this type of injury ever observed here. Doctor Kelly reported injury by this insect to many gardens in central and eastern Kansas during the late summer.

Termites appeared to be slightly more destructive during 1933. The damage by these insects was stressed in the cities during a renovating campaign in the spring. The public is rapidly becoming termite conscious, judging by the large number of inquiries received. The floors of a local grade school building and of the high school building, both less than ten years old, had to be replaced because of severe termite damage.

The Twig Girdler (Oncideres cingulatus) was somewhat more plentiful than usual, judging from inquiries.

The Wheat Stem Maggot was unusually plentiful around Manhattan during 1933.

The Wheat Straw Worm was less plentiful in 1933 than during the previous year, according to Doctor Kelly. The first brood was diminished by the unusually dry weather, such that the second generation was small.

Garden Web Worms were not numerous in alfalfa fields in 1933. Moths of this species were plentiful at lights about the middle of June. While this species was reported as plentiful in many western counties, it is believed that some of these reports referred to the presence of dark corn earworms in alfalfa, judging by specimens sent to the Department of Entomology.

Loxostege commixtalis moths were again plentiful all over northwest Kansas, especially from Norton County westward, according to Doctor Kelly. They were plentiful in Riley County in April and May, but no larvae were seen or reported.

Mr. John Bell, County Agricultural Agent at Hoxie, sent in many larval tubes of this species which he found in large numbers beneath the surface of the soil near weed clumps in Sheridan County. Each tube was lined with white silk and contained an overwintering prepupa. The tubes were about 1½ inches long and were covered with closely packed particles of black soil. The larvae were thought to have fed on pig weeds.

The Sugar-Beet Web Worm was reported as plentiful in western Kansas again, where it fed particularly on Russian thistle during September. They were practically absent in Riley County.

Two species of previously unreported lepidopterous leaf miners were discovered working in the college orchard by Dr. G. A. Filinger. They were identified by Miss Braun as **Ornix prunivorella** Chambers and **Lithocolletis malifoliella** Braun. The first species was the more common and did considerable injury to apple foliage during the summer.

SUMMARY

The year 1933 was the third of a series of abnormally hot, dry years. One cold wave featured the opening of the year 1933 and another marked its close, but excepting for the year 1931, the twelve months were the warmest in the 73 years records have been kept at the college weather station. The mean temperature for the year was 58.39 degrees, which is 4.8 degrees above the normal, and within two-hundredths of the record for 1931, which was 58.41 degrees.

For the second straight year, the rainfall was below normal at Manhattan, being only 21.99 inches which was 9.45 inches below the normal yearly rainfall. The rainfall for 1932 was only 23.93 inches. Rainfalls for 1933 were timely, however, as most of the crops showed fair yields and fall seedings made good growths.

The following insects were **less numerous** than last year in Kansas during 1933; grasshoppers, hessian fly, stalk borer, corn billbugs, walnut caterpillar, tomato worm, potato leafhopper, variegated cutworm, beet and garden webworms, fall armyworm, bagworm, clover leaf weevil, and the green-striped maple worm.

The following insects were approximately **as plentiful** in Kansas as in 1932: White grubs, wireworms, corn earworm, biting flies, ants, false wireworms, alfalfa web worm, cabbage worm, squash bug, mosquitoes (fall), and apple curculio.

The following insects were **more plentiful** than in 1932: Wheat stem maggot, corn leaf aphid, arborvitae aphid, alfalfa caterpillar, apple tree tent caterpillar, blister beetles, cotton worm moths, flea beetles, striped cucumber beetle, pickle worm, squash borer, apple twig

borer, squash vine borer, melon worm, termites, twig girdler, codling moth, and Colorado potato beetle.

The following insects occurred in local or general outbreak in Kansas during 1933: Chinch bug, false chinch bug, cankerworms, pea aphids, mites on evergreens, army cutworm, and flea beetles.

NOTES ON TWO VESPULA NESTS FROM KANSAS*

ARTHUR W. LINDQUIST(1)
Uvalde, Texas

There are a number of observations in the literature pertaining to the size and population of the nests of the Vespidae. Betz (1932) reviews this literature and concludes that a wide variation exists in population, number of cells, and number of combs in nests of different species as well as in nests of the same species. Bequaert (1932) states that "in mid-summer the nests of **Vespula maculifrons** R. du Buyson comprise four to eight horizontal combs of cells, opening downward, and some 400 to 700 workers in addition to the old queen." He also states that "most, if not all, the accounts of the habits credited by North American Entomologists to **V. germanica** really refer to **V. maculifrons.**"

The following observations are presented as an addition to our knowledge of **V. maculifrons.**

On September 23, 1929, while on a field trip with Dr. R. H. Painter, a nest of the yellow jacket, **Vespula maculifrons** R. du Buyson* was discovered. The colony was located four miles west of Manhattan, Kansas, in a clay bank by the side of a road. As the wasps were very active, they were not disturbed until after sundown. At this time a teaspoonful of cyanogas was placed in the entrance of the nest, which was then closed with a handful of soil. The next morning seven dead wasps were found outside of the burrow. It is possible that they were foraging late and upon return after sundown were overcome by the cyanide fumes.

*Contribution No. 412 from the Department of Entomology.

(1)The material for this paper was collected while the writer was studying as a graduate student in the Department of Entomology, Kansas State College.

*Specimens determined by Dr. J. C. Bequaert (See Entomologica Americana, 12, p. 94, (1932).

The entrance to the nest, which was on a sloping bank, was oval in shape, measuring one-half by one inch and extending back two inches, where it opened into an oval cavity measuring 11 by 7¾ inches. In the cavity was a paper nest separated from the earthen wall by a space of approximately one-half inch. The paper nest was oval in shape, being 6¾ inches in transverse diameter and 10 inches in height. The nest was attached to roots at six places. The opening into the nest itself consisted of a one-half inch hole in the paper envelope. Figure I shows a section through the nest.

The paper covering consisted of a number of layers inside of which were suspended nine combs or tiers of cells, each being separated from the other by 10 to 24 pillars. The distance between the combs was three-eighths of an inch. The combs were circular and, as is shown in Table I, those combs with the greater diameters were in the middle, while those with lesser diameters were at the poles.

The nest was populated by 1,735 workers, 269 drones and 27 queens. The numbers of cells and brood, and diameters of combs, are given in Table I. The total number of cells was 6,137, and the total number of immature forms was 2,952, with brood being found in seven of the combs. The first five combs consisted of worker cells. These cells had an average diameter of 4.4 mm., while the lower four combs had cells 5.5 mm. in diameter and were used for queen and drone production. It is interesting to note that there were 900 brood cells which would develop into either queens or drones. Of this number only a few queens probably escape enemies and survive the winter.

Table I. Number of Cells and Brood, and the Diameter of Combs in Nest of **Vespula maculifrons**

Comb No. from top	Diameter of comb inches	No. of cells	No. of immature forms
1	3.5	415	0—worker cells
2	5.5	750	508—worker cells
3	6.	1,070	425—worker cells
4	6.	1,020	540—worker cells
5	6.5	1,130	580—worker cells
6	6.	640	460—queen and drone cells
7	5.75	550	330—queen and drone cells
8	4.75	460	110—queen and drone cells
9	2.	102	0—queen and drone cells
Totals:		6,137	2,952

Directly behind the nest was a burrow leading down into the earth at an angle of about 20 degrees. It varied from five-eighths to one inch in diameter, and extended with many curves for at least 159 inches, where further excavation was discontinued. At its deepest point this tunnel was 40 inches below the surface of the ground. That the burrow was in use was shown by the fact that 10 wasps were found in the tunnel during excavation.

Beginning at a point 80 inches from the mouth of the burrow there were found innumerable small black dung pellets, which from all appearances appeared to be the feces of the wasps. A dissection of the hind-gut of the wasps appeared to prove that these pellets were wasp feces. At some points in the burrow the pellets were strewn about an eighth of an inch deep. It appears possible that this area was a defecating place of the wasps. Any other purpose for this extended burrow is difficult to explain, as it does not seem probable that the wasps dug the extremely long tunnel. The writer is of the opinion that the tunnel was originally formed by a root and that the wasps discovered the decaying root and made use of the wood in construction of the nest. During the process of excavation a number of roots were encountered with diameters similar to that of the tunnel and which were in various stages of decay. However, at no point in the burrow was there any direct evidence to show that the tunnel had been previously occupied by a root.

The second Vespula nest was found October 18, 1930, about three miles east of Manhattan, in a densely wooded bottom. The excavation was done with the assistance of Dr. Painter and one of his classes in entomology.

The wasps were killed by the method used in the previous instance. The surface opening of the nest was an inch in diameter and situated on flat ground. The burrow extended down three inches and then followed a lateral course for 14 inches, where it opened into the nest cavity. Figure II is a photograph of the tunnel and nest. The paper nest, which was nine inches below the soil surface, had three points of attachment to roots. Beneath, and in the rear of the nest, was a tunnel 12 inches long and 1½ inches in diameter, in which were found many Collembola and dipterous larvae. The larvae were reared to maturity and determined by Dr. C. T. Brues as **Triphleba fratercula** (Brues), (Phoridae).

Casual observation did not reveal any dung pellets such as were found in the other nest.

The paper nest measured 6½ inches in height and 4½ inches in transverse diameter, and contained five combs which were distorted and very irregular, being in contrast to the symmetry of the previous nest. The combs were devoid of immature stages. One hundred and thirty workers, 117 drones and 39 queens were collected from the nest. The cells were not counted, but they were considerably less in number than in the first nest. The workers far outnumbered the queens and drones in the September nest, while in the October nest the workers were in the minority. As the nest proceeds towards disintegration in the fall, it is to be expected that the number of workers diminishes more rapidly than the number of queens.

Figure I. Section through nest of **Vespula maculifrons** excavated Sept. 23, 1929.

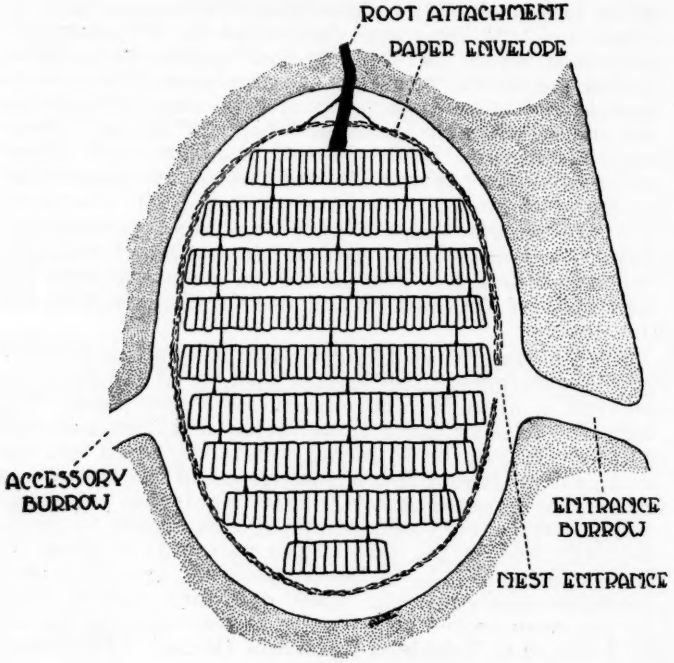
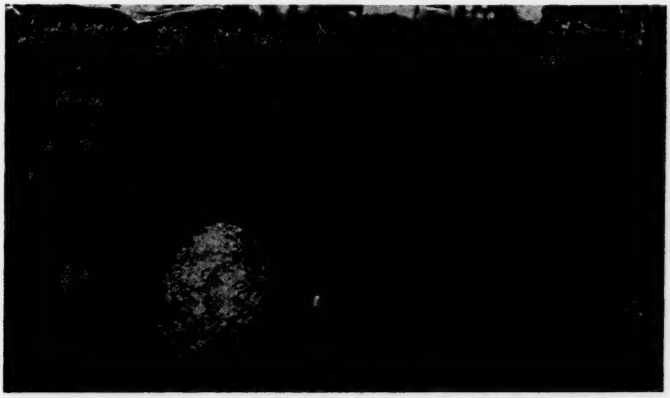


Figure II. Photograph of nest and burrow of **Vespula maculifrons,** excavated Oct. 18, 1930.



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Certain changes have been made in regard to policy of this Journal. They are indicated on the back cover page.

A NEW GENUS OF VELIIDAE (HEMIPTERA)

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Among some specimens of Rhagovelia from Mexico received from Dr. H. B. Hungerford of the University of Kansas for determination, a single large specimen with several unusual characters was noted. A careful examination disclosed the fact that it was a specimen of the recently described **Rhagovelia reposita** of Drake and Harris[1]. Later four paratypes of this species were obtained from the authors and the determination was verified. However, several characters unusual for the Genus Rhagovelia were found on the Mexican specimen and on the types and resembled certain unique characters observed on **Rhagovelia gigantea** Gould. An examination of this latter species and of the **reposita** specimens led the writer to believe that these two species have characters sufficient to erect a new genus for them.

In correspondence and conversations with the writer Hungerford stated that **R. reposita** Drake & Harris is the same as **Velia vivida** F. B. White, which he examined in the British Museum in 1928, and placed in the Genus Rhagovelia. To clear up any doubt on the synonymy of the two, a winged female paratype of **R. reposita** was forwarded to Dr. W. E. China of the British Museum, who very kindly compared it with the apterous female from which White described the species. The type was borrowed from the Perth Museum. China in a letter states that he believes the two specimens to represent the same species and adds "the colouring is the same, the structure of the antennae and legs is identical, including the peculiar tarsal structures."

Because of the unusual modification of the tarsal segments of the intermediate and posterior legs, the shape of the antennae and thorax, and other characters, the following new genus is proposed to include **Rhagovelia gigantea** Gould, **R. vivida** (White) and its synonym, **R. reposita** Drake and Harris. These two species were found to possess the same distinctive characters and yet have many specific differences. An examination of

1. Pan-Pacific Entomologist, 8:33, 1931.

other existing species of Velia and Rhagovelia may prove other species belong in this group.

VELOIDEA, gen. nov.

Genotype: **gigantea** (Gould)

Head with median depressed line over front and continuing to the posterior margin and with short curved lines on either side near posterior margin, the three lines resembling a posteriorly pointed arrow. Eyes large, ocelli absent. Rostrum stout, reaching to a little beyond the anterior coxae. Antennae long and slender, 4-segmented; segment I longest, somewhat curved, slightly stouter than the other three. (Plate I, Fig. 1). Pronotum swollen between humeri. Meso- and metasternum tumid, the metasternum angular posteriorly. Legs long. Anterior tarsi 3-segmented, the basal two small and globular, but distinct; segment III much longer, cut away ventrally on the apical two-thirds, and two stout, curved claws attached at this point; between the claws arise two membranous, claw-shaped pulvilli of the same shape and size as the claws (Plate I, Fig. 5). Intermediate legs with 3-segmented tarsi; segment I about as wide as long, segments II and III much longer; ventral half of III cut away on apical two-thirds, at which point two long, narrow claws and two flat, membranous pulvilli are attached; the claws are modified by a membranous extension of both edges, of the same structure and width as the pulvilli (Plate I, Fig. 11.). Posterior legs with armature of femora and tibiae variable; in some females there are no spines or denticulations, while in the male few to many are found; tarsi practically identical with those of the intermediate leg except for shorter length; (Plate I, Fig. 9). Connexiva broad. Genital segments of male large, claspers prominent. Suranal plates present.

Notes:—The specimens upon which this description is based are of large size (all forms measure over 8 mm. in length) and have a dark brown or black color. The sides of the pronotum in front are broadly banded with silvery iridescence that fades and narrows somewhat at the median carina. The elytra of winged forms have the basal fourth and a circular spot in the central, distal portion silvery, while in the apterous forms the basal portion of the dorsal surface of the abdomen and connexiva is silvery. The intermediate and posterior legs

are of about the same length, although in all specimens examined the intermediate legs are slightly longer. The third tarsal segment of all legs is the longest. In the males the suranal plate consists of a three-pointed process, two of which arise laterally and one posteriorly. All tend to point upward and in **gigantea** at least the ends of the lateral two appear to hook over the preceding genital segment.

The habitat of these unusual insects is unknown, but presumably is the water of running streams, where their relatives, the Velias and Rhagovelias, live. They are known to occur in South and Central America and Mexico. The collection of additional specimens or the examination of specimens now assigned to other genera may show this group to have a wider distribution.

This genus differs in several important characters from the Rhagovelia, to which both species have been recently assigned. Their size is larger; the color markings are different; and the structure of the antennae, the third tarsal segment of all legs, and the genital segments, the claspers and the suranal plate, are different. Rhagovelia have the usual claws on the anterior and posterior legs, while the third tarsal segment of the intermediate leg is cleft on its apical two-thirds and has arising from the base of the cleft two modified claws and between them pulvilli modified into 20 plumose hairs (Plate I, Figs. 6, 7 and 10). No suranal plates have been recorded on Rhagovelia and the claspers are smaller.

Members of this new genus are also closely related to Velia, but can be distinguished by their color and the structure of the tarsal segments. The third tarsal segments of all legs in Velia are armed with the usual two unmodified claws. (Plate I, Figs. 4, 8 and 12). The other two genera of the familyVeliidae, Microvelia and Macrovelia, are distinguished by having antennal segment IV longer than any of the other segments.

Key to Genera of Veliidae

1. Antennal segment IV longest 2
   Antennal segment I longest 3

2. Ocelli in contact with inner margin of eye ..... Macrovelia
   Ocelli absent ..... Microvelia

3. Tarsal segment III of all legs armed with two unmodified claws ..... Velia
   Tarsal segment III of intermediate leg with modified claws and pulvilli 4
4. Tarsal segment III of posterior leg with claws and pulvilli unlike those of intermediate leg ..... Rhagovelia
   Tarsal segment III of intermediate and posterior leg of similar structure ..... Veloidea

Species of Veloidea

Veloidea gigantea (Gould)

Rhagovelia gigantea Gould. Annals. Ent. Soc. Amer., 21:417, 1928

Rhagovelia gigantea Gould. Uni. Kan. Science Bul., 20: 32, 1931

A full description of this species is given in the above references. It is recorded only from Colombia.

Veloidea vivida (White)

Velia vivida F. B. White. Jour. Linn. Soc. Lond., Zool., 14:486, 1879.

Velia vivida Champion. Biologia Cent.-Amer., Het., 2:143, 1898.

Velia vivida Kirkaldy & Bueno. Proc. Ent. Soc. Wash., 10:205, 1909.

Rhagovelia vivida Hungerford. Annals Ent. Soc. Amer., 22:761, 1929.

Rhagovelia vivida Gould. Uni. Kan. Science Bul., 20: 46, 1931.

Rhagovelia reposita Drake & Harris. Pan-Pac. Ent., 8:33, 1931.

In 1879 F. B. White described **Velia vivida** from Nicaragua. Champion in 1898 states that this species is "imperfectly diagnosed by White" and that it is unknown to him. Kirkaldy and Bueno in their Catalogue of American Aquatic and Semi-aquatic Hemiptera list the species. In 1928 Hungerford examined the type of **vivida** and considered it to be a Rhagovelia. The writer followed Hungerford's determination and listed the species as **Rhagovelia.** In 1931 Drake and Harris redescribed the species as **R. reposita.**

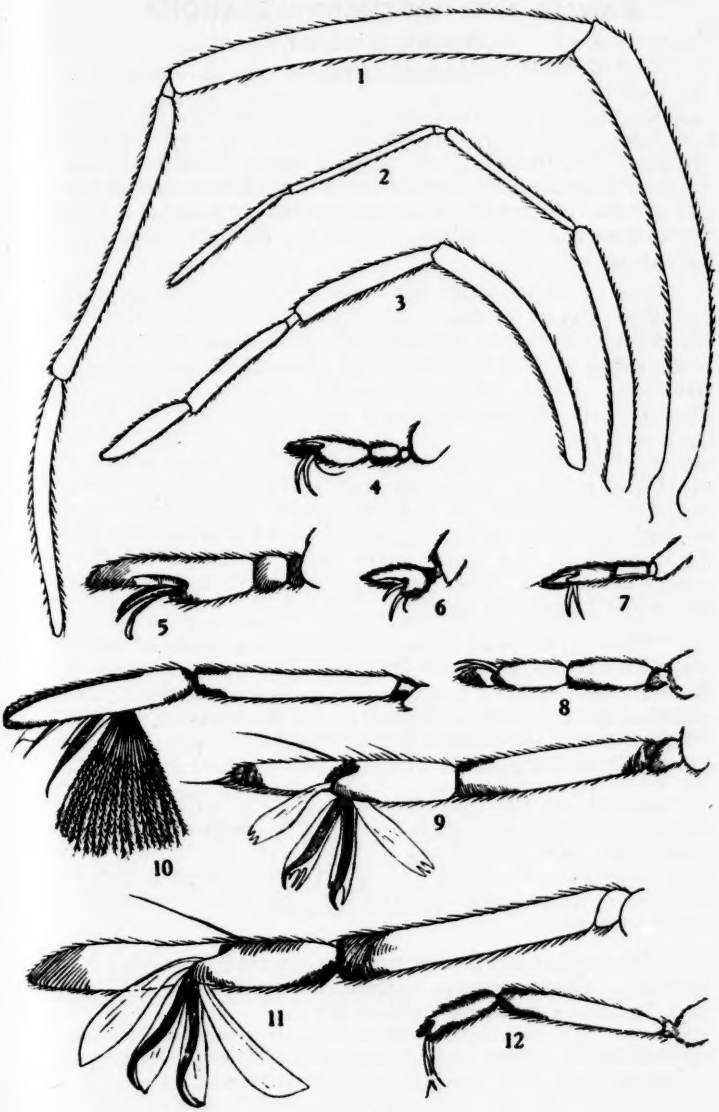
Specimens are recorded from Nicaragua, Guatemala and Mexico. This species differs from **gigantea** by the possession of long, finger-like processes on the connexiva and on the first genital segment of the female. In the case of the female the connexival processes are as long as the genital segments; the humeri are pointed. In the male of **gigantea** the posterior projecting tubercle on the venter is not noticeable, the claspers are smaller and there are no ridges on the venter of the last abdominal and the first genital segments. The claspers of the two species are similar in shape.

Explanation of Plate

1. Antenna of Veloidea
2. Antenna of Velia
3. Antenna of Rhagovelia
4. Tarsi of fore leg of Velia
5. Tarsi of fore leg of Veloidea
6. Tarsi of fore leg of Rhagovelia
7. Tarsi of posterior leg of Rhagovelia
8. Tarsi of posterior leg of Velia
9. Tarsi of posterior leg of Veloidea
10. Tarsi of intermediate leg of Rhagovelia
11. Tarsi of intermediate leg of Veloidea
12. Tarsi of intermediate leg of Velia

All drawings made to the same scale by B. F. Hinkle.

Plate I.



NOTES ON SOME BAT-FLIES OF SOUTHERN KANSAS AND NORTHERN OKLAHOMA

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In view of the fact that observations on the habits and host relationships of various species of the bat-flies (Diptera Pupipara) have seldom been recorded, the notes of this nature taken by Mr. C. W. Hibbard and myself in the bat-caves of south-central Kansas during September and November of 1933 are of more than passing interest.

The caves investigated were those in the gypsum formation south of Sun City, Barber county, Kansas. Numerous caves are present in this formation as it extends south of Sun City into and through Woods county, Oklahoma, and west into Comanche county, Kansas. On the first trip, during the early part of September, 1933, time was sufficient to find and look through only about ten or twelve caves. At this time the bats were active at night and all cave collecting was necessarily done during the day. In order to observe both taxonomic and ecologic differences in the bat fauna as affected by winter conditions, the same caves were again visited November 2-3, 1933. These caves are described in more detail by Hibbard (in press).

Three species of these ectoparasites, some of which were kindly identified by Dr. G. F. Ferris, were secured: **Basilia antrozoi** (Townsend) (Nycteribiidae), **Trichobius quadrisetosus** (Kessel) and **T. major** Coquillett (Streblidae). Only the latter has previously been reported from Kansas, on **Myotis***.

About thirty specimens of the nycteribiids were taken in September from twenty-five **Antrozous** sp. (a new form, being described by Mr. Hibbard), which were in a cluster on the roof of a short tunnel near a natural bridge 3-4 miles south of Sun City. No other nycteribiids were secured.

Trichobius quadrisetosus was secured from two host species: **Corynorhinus rafinesquii pallescens** (Miller) and **Tadarida mexicana** (Saussure).

*Kessel, Quinta Cattell. 1925. A synopsis of the Streblidae of the World. New York Ent. Soc., Jour. 33: 11-34, pls. 1-4.

On the earlier trip, during September, **Tadarida mexicana** was the only bat found in any abundance, and this only in a comparatively large cave in Woods county, Oklahoma, one-half to three-quarters of a mile south of the Kansas-Oklahoma line. Here they were present in huge numbers, clinging together in large clusters on the ceiling in various rooms of the cave. Due at least in part to their gregarious habit, they were extremely heavily infested with external parasites of other kinds (fleas, mites and ticks), yet only by way of exception were they infested with bat-flies, as only one specimen (possibly accidental) was taken from the large series examined for parasites.

However, another species of bat **(Corynorhinus rafinesquii pallescens)** which occurred in the cave in much smaller numbers was found to be very heavily parasitized with **T. quadrisetosus,** a single individual harboring as many as eight or ten. These bats were by far the most wary of all the species (7) secured in that general region, usually occurring singly, only rarely in small clusters of two or three (once found in a cluster of about 25). They always hung by one leg, so that upon the approach of a light, they immediately dropped and flew away to more nearly inaccessible regions of the cave. Obviously their solitary habit is not so conducive to the general distribution of the streblids to all individuals of the species as is the gregarious habit of the **Tadarida,** yet they are far more heavily parasitized by the flies. This discrepancy might be accounted for by the fact that the hair of **Tadarida mexicana** is extremely short (2-3 mm.), while that of **Corynorhinus r. pallescens** is long (7-8 mm.) and affords better protection and a better 'foot-hold' for the streblids. The long ears of **Corynorhinus,** contrasted with the very short ones of **Tadarida,** are no doubt also a special attraction for the flies, as they were more frequently found in them than in any other definite region of the body.

No **Tadarida** were found in hibernation, so observations upon winter infestation were impossible.

Corynorhinus r. pallescens was found to be infested wherever it occurred, in occasional caves of Kansas as

well as of Oklahoma. They were found active upon both hibernating and active bats.

Large numbers of **Trichobius major** were secured in November from hibernating **Myotis velifer incautus,** which occurs in large or small clusters in numerous caves about Sun City and Aetna. Only four specimens of this bat were taken in September on the first trip, and only one **T. major** on these. The hair of this species is 4-5 mm. long. Kessel **(op. cit.)** has reported **T. major** from the same host genus from Kansas. This is apparently the only previous mention of bat-flies from the state. He also reported **Trichobius corynorhini** Cockerell from **Corynorhinus macrotus** (probably, according to Mr. Hibbard, **C. rafinesquii**) from Colorado. This is quite likely the same as that here reported as **T. quadrisetosus, fide** Ferris. The relationships of these two forms are apparently doubtful at best.

Dr. R. H. Painter has informed me that there are some unidentified streblids in the Kansas State College collection at Manhattan. One series was collected October 27, 1905, by Sheffer, "on bats **(Myotis)** in a cave in Barber Co., near Sun City and close to Marty's ranch." Another series was collected March 9, 1907, on bats, by C. S. Marty. The former series is almost undoubtedly of **Trichobius major.**

None of the remaining three species of bats **(Pipistrellus subflavus subflavus** (F. Cuvier); **Eptesicus fuscus fuscus** (Beauvois); **Myotis lucifugus lucifugus** (Le Conte) found in this region was, for one reason or another, found infested with bat-flies.

I wish to acknowledge my indebtedness to Mr. C. W. Hibbard, whom I accompanied on the above mentioned field trips, for the opportunity to collect this material, and for the identification of the bats; also to Dr. R. H. Painter for invaluable aid with the manuscript, literature and specimens; and to Mr. G. F. Ferris for identifying certain specimens and expressing opinions regarding the relationships of certain species of bat-flies.

NOTES ON THE LARVA AND LARVAL HABIT of ISOHYDNOCERA CURTIPENNIS (NEWMN.) (COLEOPTERA, CLERIDAE) *

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An interesting rearing record of the Clerid beetle, **Isohydnocera curtipennis** (Newmn.) (**Hydnocera longicollis** Ziegl.), prompted a further study of the larval habits of the insect. An adult of this species emerged May 12, 1932 from a large gall of the Solidago Gallmoth (probably **Gnorimoschema gallaesolidaginis** Riley), collected April 17, 1932 at the Sand Dunes near Medora, Kansas. Examination of the gall showed it to be complete, except for a small hole punctured in the tissue of the emergence window, through which the beetle had emerged. The gall was opened, and the pupal shell of the Lepidopterous insect was found to be whole, except for a slight break at one end. Inside of this shell was the small cast skin of the beetle. From these circumstances, it is believed that this is a case of true endoparasitism, in the sense of the parasitoid habit, in which the adult is free-living and the larva parasitic.

A search of the literature revealed comparatively meager data on the larval habits of the Cleridae. Most of the adults have been collected by sweeping or beating, and if reared at all, they are recorded as having emerged from dead branches, stems of plants, etc., with no indication of the true food of the larvae. In general it is stated that the Cleridae are predaceous in both larval and adult stages, particularly on wood- and bark-boring beetles, and in some species on the larvae of bees and wasps, on Lepidopterous larvae, and on locust egg-pods.

According to Boving and Champlain(1), the larvae

*Contribution No. 417 from the Department of Entomology.

**The writer is indebted to Dr. R. H. Painter of Kansas State College for his generous advice and encouragement, and to Dr. E. A. Chapin of the Bureau of Entomology for checking the identification of the insect and for notes on "parasitism" in the Cleridae.

(1) Boving, Adam G., and Champlain, A. B. 1920. Larvae of North American beetles of the family Cleridae. U. S. Natl. Mus. Proc. 57:575-649, pls. 42-53.

of **Hydnocera,** in which the present species was formerly classified, are "predaceous on the larvae of small woodborers, the larvae of gallmakers, and on the larvae of insects inhabiting the pith of annual plants." Several of the species have been reared from galls. Osten Sacken[2] reared **H. verticalis** (Say) from a Cynipid gall on **Quercus alba,** and from the evidence he supposed that the predaceous larva pierced the gall, consumed the larva within, and then pupated in the gall. **Hydnocera pubescens** Lec., **knausi** Schffr. and **unifasciata** Say have also been reared from galls, according to a letter from Dr. E. A. Chapin. **Isohydnocera curtipennis** (Newmn.), which has often been recorded under the synonym **Hydnocera longicollis,** has usually been said to breed in witch hazel and hickory, either as a borer or as a predator on wood-boring larvae, although Baker[3] recorded it as appearing in a cage containing galls of the Tenthredinid, **Euura s-nodus.**

Description of the larva

(Species reared, cast skin and imago in the author's collection. Description after cast skin found inside Lepidopterous pupa.)

Total length, 2 mm.; extreme width, 0.5 mm. Head large, subquadrate, 0.5 mm. wide; proportionate length of basal, second, and apical antennal joints as 3:1:2; mandible length to width about as 7:4, retinaculum knob-like, midway between base and apex of mandible, the tooth behind the apex low and rounded. Prothoracic dorsal shield well-sclerotized, large and conspicuous, as wide as the head but slightly shorter; meso- and metathorax comparatively short, fleshy. Abdomen short and slender. Head and thorax together comprise about three-fifths of the total body length. Setae long, numerous, especially on the ninth abdominal segment and the sides of the pronotum.

General appearance pale yellow, darker anteriorly. Head capsule pale yellow; a narrow hind margin and the anterior portion slightly darker, especially the clypeus and basal portions of the mouth parts; mandi-

(2) Osten Sacken, C. R. 1861. On the Cynipidae of the North American oaks and their galls. Ent. Soc. Phila. Proc. 1:47-72 (see p. 68).

(3) Baker, C. F. 1895. Biological notes on some Colorado Coleoptera. Ent. News 6(1):27-29.

bles dark brown; ocellar fields black brown, with the pale ocelli in sharp contrast, the ventral ocellus of the anterior row less distinct because not encompassed by the spot. Prothoracic dorsal shield brown; prothoracic sternal plate and presternal sclerotizations pale brown; hypopleural sclerotizations black brown, well developed, concave dorsally; remainder of thorax pale yellow to whitish. Legs pale yellow with pale brown coxae and brown tarsi. Abdomen pale, spiracles appearing as a row of black brown spots; ninth abdominal segment in dorsal view broad and plate like, obtusely scutate, slightly more than 1½ times as broad at the base as long, the apex rounded, a fringe of numerous prominent setae on and near the margin; the cerci absent as in the known **Hydnocera,** but the basal plate of the cerci large and well defined, dark brown, subcircular, with two lateral lobe-like extensions of the sclerotized area, the plate occupying the median half of the dorsal surface of the ninth somite. Dorsal aspect of the ninth segment and basal plate very similar to that of the larva of **Thaneroclerus girodi** (Boving and Champlain, l. c., pl. 49, fig. 101). All membranous parts pale. Sclerotized parts shiny. Setae pale yellow, generally long.

According to the arrangement by Boving and Champlain (1920) of the subfamilies of Cleridae, based on larval characters, this larva belongs to subfamily "E", in which the frons ends posteriorly with a straight, transverse margin and the epicranial suture is lacking. To this subfamily belongs the genus **Hydnocera,** in which the present species was formerly classified. **Curtipennis** agrees in the main with the generic characters of **Hydnocera,** as defined by Boving and Champlain from the known larvae of that group, but differs chiefly in the large and distinct basal plate of the cerci. The basal plate resembles that of **Thaneroclerus girodi,** but the larvae may be separated by the presence in **Thaneroclerus** of the epicranial suture, posteriorly angulate frons, median gular tubercle, and rudimentary cerci. In the absence of cerci and in the appearance of the basal plate and ninth abdominal segment, **I. curtipennis** also resembles the larva of **Zenodosus sanguineus** (Say), described by Boving and Champlain(4), but

(4) Boving and Champlain. 1922. The larva of the North American beetle *Zenodosus sanguineus* (Say) of the family Cleridae, Ent. Soc. Wash. Proc. 24:9-11, pl. 4.

Zenodosus differs by the same characters as **Thaneroclerus**, except for the absence of cerci.

The larva of **Isohydnocera curtipennis** runs to the genus **Hydnocera** in the key of Boving and Champlain (1920). It may be distinguished from the three species of **Hydnocera** described in that work as follows: from **H. scabra** Lec. by the nearly semicircular, pale yellow basal plate of the latter; from **H. verticalis** (Say) by various color markings in which the two species differ; and from **H. pubescens** Lec. (?) by the dark coloration of the abdomen and by the nearly semicircular basal plate in that doubtfully identified species.

TWO NEW SPECIES OF NORTH AMERICAN EXOPROSOPA (BOMBYLIIDAE; DIPTERA)*

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The following descriptions are published at this time to permit the return of borrowed material and the use of the names in other publications. The author has in preparation a monograph of this genus in which monograph these and other species will be illustrated.

Exoprosopa anomala n. sp.

Body mostly black pilose and tomentose; abdominal segments 4, 7 and sides of 2 white tomentose. Wings with basal two-thirds black, with hyaline windows in center of discal and apex of cell R.

Male.—Ground color entirely black; pile and tomentum black; long yellowish to reddish pile on anterio-dorsal part of thorax; white tomentum on occiput above, lateral margins of mesonotum, anterior corners of first abdominal segment and a band across center of third and most of seventh: Vesture of abdomen is mostly scale-like. Wings with basal two-thirds black, the division running from the tip of vein R_1 diagonally to fork of vein $R_{2 \text{ plus } 3}$, basally to opposite apex of discal cell, transversly through base of cell M_2, basally a short,

*Contribution No. 421 from the Department of Entomology.

distance then diagonally to tip of anal cell; all of the discal cell lies in the black portion, but near its center is a transverse, oblong hyaline spot. The usual round subhyaline spot in apex of cell R_2. A fringe of white scales on squamae, claws with a short, sharp basal tooth.

Female—Similar to male; width of front about the same. The measurements in millimeters given below show a variation that is not unusual in this genus. The paratype measured is from Kingsville, Texas.

Parts	Type Male	Allotype Female	Paratype Female
1st segment of antenna	0.16 mm.	0.26 mm.	0.33 mm,
2nd segment of antenna	0.10 mm.	0.09 mm.	0.13 mm,
3rd segment of antenna	0.36 mm.	0.36 mm.	0.49 mm.
Style of antenna	0.23 mm.	0.16 mm.	0.19 mm.
Length of body	8.0 mm.	8.0 mm	11.0 mm.

Holotype—(Male) Ballinger, Tex., Aug. 30, 1926, in sandy area (R. H. Painter)

Allotype—(Female) Kingsville, Tex., July 24, 1921 (F. M. Hull).

Paratypes—1 (Female) Kingsville, Tex., June 6, 1921 (F. M. Hull)

1 (Female) Culberson Co., Tex., July 2, 1927 (L. A. Stevenson) in Snow collection.

1 (Male) Globe, Ariz., July 27, 1932 (R. H. Painter)

1 (Male) Las Cruses, New Mexico, Aug. 9, 1932 (R. H. Painter)

2 (Females) Separ, New Mexico, Aug. 8, 1932 (R. H. Painter).

This species superficially resembles **V. chimaera** O. S. and is more like species of the subgenus Hemipenthes than the genus Exoprosopa. In actual characters it is an Exoprosopa and is most closely related to **rhea** O. S. The front in the male is broader than usual for the genus. The tip of the discal cell is hyaline in one of the paratypes.

Exoprosopa xanthina n. sp.

A large yellow, mostly yellow tomentose species; front border of wings brownish as in **hulli,** proboscis not projecting. Length, 11 to 17 mm.

Male.—Ground color yellowish brown; the following parts black or darker brown: Proboscis, third segment of antennae, upper half of front and occiput, disk of mesonotum, pleurae (largely), tips of front tibiae, tarsi, base of first abdominal segment, and basal triangles of decreasing size on segments 2, 3, 4 and 5.

Pile yellowish to white; partly black on upper part of front and apices of fifth and sixth abdominal segments. One or two black hairs on basal segment of antenna. Tomentum yellowish to white; a few black scales on apex of second, third and base of fifth abdominal segments; venter white tomentose and pilose. Spines of anterior part of thorax reddish, on posterior parts and legs black; no spines on front tibiae. Wings hyaline, the front margin brownish. The border of this margin begins at apex of subcosta and curves through the anterio-proximal part of the discal cell and cell R. Vein at base of second M_2 and Cu_1 clouded with brownish. Length of first segment of antenna 0.23 mm., second segment 0.13, third segment 0.48, style 0.29 mm. Length of body, 15 mm.

Female.—Similar to male; the black pile and tomentum almost entirely lacking. First segment of antenna 0.33 mm., second segment 0.13, third segment 0.56, style 0.29; length of body 17 mm.

Holotype male, allotype female; 39 male and nine female paratypes, Los Banos, Calif., July 28, 1930 (T. F. Winburn and R. H. Painter collectors). Also many additional specimens not in paratype series (author's collection).

Four paratype males, Sacramento County, Calif., Aug. 7, 1929, (R. H. Beamer) (P. W. Oman) (L. D, Anderson) in Snow collection.

The California specimens are rather uniform in appearance; there is some variation in the amount of black scales on the abdomen; some specimens lack them entirely. Three males were collected at Sacaton, Arizona, Aug. 8, 1930 (T. F. Winburn and R. H. Painter) which probably belong to this species. The proportions and coloration are the same as has been described for the type, except that there are more black scales on the abdomen and the specimens are larger (21 mm.).

PROGRAM

TENTH ANNUAL MEETING
KANSAS ENTOMOLOGICAL SOCIETY

April 28, 1934
Room 119 — Science Hall
University of Wichita, Wichita, Kansas.

Kansas Entomological Society Business Session ..... 10:00—11:00 a. m.

Presentation of papers ..... 11:00—12:00 a. m.

1. Report of the Central States Entomologists' meeting at Lafayette, Indiana. - - - - - - - - H. B. Hungerford
2. Biology and control of the western apple curculio (**Tachypterellus quadrigibbus magnus** List, Coleoptera, Curculionidae) (Lantern) - - - R. L. Parker
3. **Phyllophaga** (Scarabaeidae, Coleoptera) in Kansas. - - Milton Sanderson
4. Preliminary report on the genus **Listronotus** (Curculionidae, Coleoptera) - L. S. Henderson
5. An interesting deformity in some larvae of **Melanotus fissilis** Say (Elateridae, Coleoptera) - - - H. R. Bryson

Presentation of papers ..... 1:30 p. m. ——

6. **Eurytoma tylodermatis** Ashm., **Microbracon variabilis** (Prov.), **Microbracon tachypteri** Mues. (Hymenoptera)—parasites of the apple curculio. - - P. G. Lamerson
7. Preliminary survey of the Collembola of Kansas. - - - Melvin Griffith
8. Some recent developments in termite control - - - Roger C. Smith
9. Collecting spiders - - W. S. Wagner
10. A report of the codling moth conference at Lafayette, Ind., Feb. 27, 1934. - Geo. A. Dean
11. The genus **Enithares** (Notonectidae, Hemiptera). - - - H. T. Peters
12. Preliminary studies on Microvelia (Veliidae, Hemiptera). - Porter McKinstry
13. Notes on the Chloropidae (Diptera) of Kansas. - - - Curtis W. Sabrosky

14. Another apple pest in Kansas, **Ornix prunivorilla** Chambers (Tineidae, Lepidoptera), the unspotted tentiform leafminer. - - - L. M. Copenhafer
15. A preliminary survey of the Issinae (Fulgoridae, Homoptera) - - - - - - Katherine C. Doering
16. Resistance of varieties of species of **triticum** (Gramineae) to Hessian fly. - R. H. Painter
17. The life history of **Arytaina amorphae** (Chermidae, Homoptera) - W. F. Harms
18. Biological control of weeds by the use of insects, with special reference to the cocklebur in Australia. - Sam G. Kelly
19. The genus **Bythoscopus** (Cicadellidae Homoptera) - - - P. B. Lawson
20. Some species of **Erythroneura** (Cicadellidae, Homoptera) on Crataegus. - - - R. H. Beamer and Melvin Griffith
21. The Gregarious Habits of Beetles - - - - E. Graywood Smythe, Hacienda Cartavio, Salaverry, Peru.

Final Business Meeting

Election of Officers.

Note, in No. 14, **prunivorilla** should read **prunivorella.**

An interesting habit of the Syrphid fly, **Volucella isabellina** williston, was observed by the writer and Dr. and Mrs. R. H. Painter on July 26, 1932 near Roosevelt, Arizona. During a visit to the cliff dwellings at the Tonto National Monument, these large flies were observed clinging to the under side of the rock roof behind the dwelling. They were very numerous in this dark cave, but not very active. A number of males and females were collected by hand in a very few minutes. The species was described in 1886 from a single female from Arizona. A few specimens have since been recorded from New Mexico, Colorado and Mexico.

CURTIS W. SABROSKY.

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